

19.1 ACID-BASE THEORIES

Section Review

Objectives

- Define the properties of acids and bases
- Compare and contrast acids and bases as defined by the theories of Arrhenius, Brønsted-Lowry, and Lewis

Vocabulary

- monoprotic acids
- diprotic acids
- triprotic acids
- conjugate acid
- conjugate base
- conjugate acid-base pair
- hydronium ion (H_3O^+)
- amphoteric
- Lewis acid
- Lewis base

Part A Completion

Use this completion exercise to check your understanding of the concepts and terms that are introduced in this section. Each blank can be completed with a term, short phrase, or number.

Compounds can be classified as acids or bases according to 1 different theories. An 2 acid yields hydrogen ions in aqueous solution. An Arrhenius base yields 3 in aqueous solution. A Brønsted-Lowry acid is a 4 donor. A Brønsted-Lowry base is a proton 5. In the Lewis theory, an acid is an 6 acceptor. A Lewis base is an electron-pair 7.

An acid with one ionizable hydrogen atom is called a 8 acid, while an acid with two ionizable hydrogen atoms is called a 9 acid.

A 10 is a pair of substances related by the gain or loss of a hydrogen ion. A substance that can act as both an acid and a base is called 11.

- 3
- Arrhenius
- hydroxide ions
- proton H^+
- acceptor
- electron pair
- donor
- monoprotic
- diprotic
- conjugate acid-base pair
- amphoteric

Part B True-False

Classify each of these statements as always true, AT; sometimes true, ST; or never true, NT.

- NT 12. Hydrochloric acid is a strong acid that is diprotic.
- NT 13. The ammonium ion, NH_4^+ , is a Brønsted-Lowry base.
- AT 14. A Brønsted-Lowry base is a hydrogen-ion acceptor.
- ST 15. A compound can act as both an acid and a base.
- AT 16. PBr_3 is a Lewis base.

Part C Matching

Match each description in Column B to the correct term in Column A.

Column A

- g 17. monoprotic acids
- d 18. triprotic acids
- a 19. acid properties
- h 20. base properties
- e 21. conjugate base
- i 22. conjugate acid
- c 23. hydronium ion (H_3O^+)
- f 24. Lewis acid
- b 25. Lewis base

Column B

- a. tastes sour and will change the color of an acid-base indicator
- b. an electron-pair donor
- c. a water molecule that gains a hydrogen ion
- d. acids that contain three ionizable hydrogens
- e. particle that remains when an acid has donated a hydrogen ion
- f. an electron-pair acceptor
- g. acids that contain one ionizable hydrogen
- h. tastes bitter and feels slippery
- i. particle formed when a base gains a hydrogen ion

Part D Problem

Answer the following in the space provided.

26. Identify the Lewis acid and Lewis base in the following reaction. Explain.

